Sinking a Gas Well

By Palmer Stickney

ONE of the most important of the natural resources of this country is natural gas. Morgan, in "A Text Book of American Gas Practice," says that in 1929, the people of this country used 1900 billion cubic feet of natural gas, equivalent in heating value to 70 million tons of soft coal. Its use fell off during 1900, 1931, and 1932, due mainly to increased industrial activity. During the early years of its use natural gas was extravagantly wasted and as a result we have now begun to realize that the supply is not inexhaustible and must be wisely conserved.

The use of natural gas in heating is not new. Over 1000 years ago the Chinese piped it in bamboo pipes for this purpose. The Chinese and Hindus devised a laborious method of hand drilling centuries ago. A heavy drill was raised a few feet at a time by a rope and lever and allowed to fall of its own weight. These, however, were preceded by large "dug" wells, which sometimes reached a depth of as much as 100 feet.

The French used natural gas for street lighting in the early nineteenth century. The Grenelle and Passy wells which supplied Paris were completed about 1840 and required ten and six years respectively to complete them. The Grenelle well was started with a diameter of 40 inches but has a flow pipe eight inches in diameter and is 1780 feet deep. Subsequently a 47-inch well, 2900 feet deep was drilled by steam power at Butteaux-Cailles.

Due to the fact that petroleum and natural gas so often occur together, their extraction is closely interlocked. Oklahoma and California are the chief producers of petroleum but the Pennsylvania oil is regarded as superior quality. Ohio ranks about tenth in the production of petroleum but is one of the leading gas producing states.

The first well sunk exclusively for oil was put down near Titusville, Pennsylvania, in 1859, by Col. E. L. Drake. He used a small derrick very similar to the modern American system. Since this time the American system has been adopted for puttng down water, oil, and gas wells all over the world. This system is notable for its simple and effective machinery.

The Actual Operation

Naturally, before a well can be drilled a site must be chosen. Often this is rather a hit and miss process but wells are usually sunk in old gas fields. By properly placing a well in a territory which has supported a number of wells, a good return can usually be assured.

When a site has been chosen, a derrick rig is transported to the spot and set up. This is no simple task as these rigs are often twenty feet square at the base and upwards of 70 feet in height. The bull wheel, on which the drill cable is wound, is ten feet high and weighs four tons while the gas engine used for power is even heavier, though not so bulky. That such a derrick is no frail structure can be seen from the fact that more lumber is used in its construction than in the average seven room house.

After the construction crew has set up the derrick and bull wheel, the drillers and tool dressers take charge and install the gas engine. A compressed air outfit must be set up to start the engine because its compression is so great that it cannot be started by hand. Next to the derrick a shallow pool is usually dug to receive the water, mud, and sand brought up while drilling. If this residue, which contains much mineral matter, is emptied on surface soil it will ruin the ground for agricultural purposes for years.

After about six weeks of preparation the set-up is ready for actual drilling. This begins with the attachment to the drill of an iron casing or drive pipe nine inches in diameter. These drills, incidentally, are of the percussion type and do not work with a rotary motion. The 2500 pound drill smashes down repeatedly forcing the casing into the ground to a depth of about six or eight feet. At this point the drill assumes its primary duty as a drill rather than a hammer. The blocks by which the casing was attached are now removed and the drill is allowed to dig to a depth of about fifteen feet. At this time a new section of casing is attached. The drill is once again used as a hammer and the drive pipe is extended to the level of the drilled hole. This operation is repeated until bed rock is reached. The drive pipe ends when bed rock is reached since its only duty is to prevent the soft upper soil from caving in on the well.

When bed rock is reached a smaller bit is used and an eight inch pipe, called the "short string," accompanies the drill on its downward journey. This "short string" is about 450 feet long and is used to prevent salt water springs from flooding the well. At this juncture it might be well to mention the bailer. As often as the drill penetrates a depth equal to the length of the temple screw, it must be removed and swung to one side. The temple screw controls the rate of progress. The bull wheel, mentioned earlier, and a crown pulley are used to raise the drill and its auxiliaries on their cable. Meanwhile the sand pump is lowered into the well by means of the sand wheel and bailing drum. This is done to withdraw the mud from the bottom of the well. While the bailing goes on the bit is tested by the tool dressers and sized if necessary.

After the short string is completed, a new long string is started with seven inch pipe. This pipe will reach to a depth of about 1800 or 1900 feet, or in other words to the gas deposit, if any. When this is completed, the short string will be removed. The long string is sunk in much the same manner as the short string. Before reaching the gas sand, the drill will pass through several distinct strata of rock. These are usually in the order named: clay, gravel, shale, limestone, shale, shell, rock and shale. In this state the gas sand usually occurs about 1900 feet. It is fine-textured gray sand often called Clinton sand. At the end of the sand stratum, brick red madina rock is brought up in the bailer. This red rock is the stop signal for drilling operations. If a good layer of gas sand has been found, a two-inch pipe is inserted and the long string withdrawn. This two inch flow pipe is cemented firmly in the last stratum of rock above the gas sand and a valve is put on top of the flow pipe.

The well is now completed and the gas is under control. While four pipes are used in the drilling operations, only two remain in the ground when the well is completed. They are the initial drive pipe and the final two inch flow pipe.

Natural gas is an exceptionally clean fuel and has a high calorific value. For these reasons it is widely used and the supply will probably be exhausted within a few hundred years. After that time some artificial substitute will undoubtedly be used.

Groundtesting Airplanes

Much of the research in the aviation field at present is being carried out on the ground by means of wind tunnels. A full sized plane can be tested in many of these tunnels under actual flying conditions. The largest of these is in the laboratory of the National Advisory Committee on Aeronautics, Langley Field, Virginia. The working section of this tunnel is sixty by thirty feet in diameter. The operation of this type of tunnel is very exjensive due to the power necessary to provide the air flow. At Langley Field two fans are used, each driven by a 4000 horse-power electric motor. When a plane is placed in one of these tunnels for testing, many of its reactions in the air can be determined. While this sort of testing has not displaced actual tests flights it has made the work of the designer more assured and test flights less hazardous.

One of the biggest problems connected with stratosphere flying is the proper streamlining for planes to be used at speeds approach—that of sound. At these speeds the conventional streamlining with rounded leading edge entails a great loss of efficiency. This will probably lead to the designing of new methods of streamlining featuring a sharper entering edge. Experts at Langley Field will attempt to find the answer to this question in a high speed tunnel now being constructed there.

Another device for testing planes under stratosphere conditions is the altitude-chamber of the Bureau of Standards. In this concrete vault different motor and cabin designs can be tested under various conditions of temperature and pressure. In this way engineers hope to answer the problem of delivering as much air to the motor at 50,000 feet as at ground level, despite the low density of the air in the stratosphere.

50 Years of Service

Did you know that the cap of the Washington monument was made from aluminum? After 50 years of service as a lightning rod on top of the monument, the cap appeared as good as new. Scientists examined the aluminum cap when this famous piece of masonry was undergoing repairs. At the time the cap was placed on the monument aluminum was selling 12 dollars a pound. Today it sells for about 21 cents a pound. This piece of metal was exhibited as a curosity prior to the completion of the monument. People who had confidence in aluminum at that time were few and far between. Today it is a different story. The cap not only stood severe tests of weathering but aluminum today is one of the most popular metals that give both strength and lightness.